

Application Serial No. 09/722,400
Response to Office Action dated September 10, 2004
Reply to Office Action dated March 11, 2004

REMARKS

In the advisory action dated March 11, 2004, the Examiner maintained his earlier rejection of the claims, in which he (1) rejected Claims 34, 38 and 46 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,922,623 issued to Tsutsui et al. (“Tsutsui”), (2) rejected Claims 39 and 50 under 35 U.S.C. § 103(a) as being unpatentable over Tsutsui, (3) rejected Claims 9, 11, 27, 28, 29, 31-33, 35, 36, 40, 42, 44, 45, 47 and 48 under § 103(a) as being unpatentable over Tsutsui in view of U.S. Patent No. 5,286,679 issued to Farnworth et al. (“Farnworth”), and (4) rejected Claims 9, 10, 12, 27, 30-33, 35, 37, 40, 43-45, 47 and 49 under § 103(a) as being unpatentable over Tsutsui in view of U.S. Patent No. 5,653,619 issued to Cloud et al. (“Cloud”). Reconsideration and allowance of the claims, as amended, are requested.

I. Anticipation Rejections

The Examiner rejected Claims 34, 38 and 46 as being anticipated by Tsutsui. Independent Claim 34, as amended, is directed an etch resistant masking layer, comprising a layer of material resistant to vapor hydrogen fluoride etchant. The layer has an opening within said layer and extending through said layer to expose a portion of an underlying layer such that said portion can be etched by vapor hydrogen fluoride etchant. The layer of material resistant to vapor hydrogen fluoride etchant is removable after etching.

This claim is not anticipated by Tsutsui. Tsutsui does not disclose (or in any way suggest) an etch resistant masking layer resistant to vapor hydrogen fluoride etchant that has an opening within said layer and extending through said layer to expose a portion of an underlying layer that can be etched by vapor hydrogen fluoride etchant. The Examiner contends that the WSi and gold layers 7, 8 shown in FIGURE 1 of the reference form the claimed mask. However, the WSi and gold layers are not a mask and do not have any type of opening within said layer and extending through said

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layer, much less any such opening to expose a portion of an underlying layer that can be etched by vapor hydrogen fluoride etchant. In the advisory action, the Examiner states that “on either side of the Au-WSi layer, there are complete openings, that is, openings that extend all the way through the openings, as the Au-WSi layer does not exist in these openings.” The Examiner is assumed to be referring to the indented portions on the left and right sides of the WSi and gold structure as the claimed openings. Even if these indentations are considered openings, neither is an opening within said layer and extending through said layer i.e., neither “opening” extends through a layer of material resistant to vapor hydrogen fluoride etchant as required by the claim. What the Examiner refers to as openings are merely indentations that extend only into the sides of WSi and gold structure and are not openings within said layer and extending through said layer.

Furthermore, as discussed below, the WSi and gold structure disclosed by Tsutsui is not a masking layer. More particularly, it is not a masking layer that is removable after etching. The WSi and gold structure disclosed by Tsutsui forms part of a final structure functioning as a gate electrode and is not removable after etching.

Claim 34 is therefore clearly not anticipated by Tsutsui. Claim 38 depends on Claim 34 and is also not anticipated by Tsutsui.

Claim 46 specifies a masking layer resistant to vapor hydrogen fluoride etchant having an opening within said masking layer and extending through said masking layer, said masking layer being removable after etching. Claim 46 is also clearly not anticipated by Tsutsui.

The rejections of Claims 34, 38 and 46 as being anticipated by Tsutsui should therefore be withdrawn.

II. Obviousness Rejections

The Examiner rejected Claims 9, 11, 27, 28, 29, 31-33, 35, 36, 40, 42, 44, 45, 47 and 48 as being obvious over Tsutsui in view of Farnworth.

Independent Claim 9 is directed to a mask for selective etching of an underlying layer using vapor hydrogen fluoride etchant. The mask comprises a layer of patterned polyimide, and is removable after said etching.

The Examiner contends that Tsutsui's WSi and gold layers are a mask because the layers are not etched while the underlying layers are etched and because they cover or mask underlying layers. The WSi and gold layers 7, 8 however are not used by Tsutsui as a mask as claimed because (1) they are not structured to enable any selective etching of the silicon film 6, and (2) they form part of the final structure as a gate electrode and are not removable after the etching process. The WSi and gold layer structure permit no selective removal of material; all of the silicon oxide film 6 beneath and around the WSi and gold layer structure is removed because it is not a mask and is not designed to permit any selective material removal.

In the advisory action, the Examiner states that "Figure 5 shows the WSi layer, a layer made of material resistant to the claimed etchant, used as a structure that permits selective removal of material underneath the structure." Presumably, the Examiner is referring to the Schottky metal film 9 (e.g., a Tungsten film) described in col. 2, lines 13-30. However, the etching described with respect to this figure is wet etching and not vapor hydrogen fluoride etching. (col. 2, lines 23-25). Moreover, all of the layer 6 is removed; there is no selective etching. Figure 5c shows a portion of the layer 4 being removed, but there is no description of the process used for this; there is no disclosure, e.g., that the structure 9 is used as a mask for the selective removal of layer 4.

Furthermore, Tsutsui is not properly combinable with Farnworth. Tsutsui's WSi and gold structure is not used by Tsutsui as a mask for selective material removal, much less as a photoresist mask. Thus, one skilled in the art would not look to any other reference for any teaching of any particular type of a photosensitive mask to combine with this teaching of Tsutsui.

In addition, Farnworth also does not suggest combination with Tsutsui. Farnworth is directed to a method for attaching a semiconductor die to a leadframe using a patterned adhesive layer. Farnworth teaches in col. 6, lines 50-61 that the adhesive layer could be formulated from photosensitive materials known generally as polyimide siloxanes. A mask is used to form the pattern on the adhesive photosensitive materials. The adhesive layer formulated from polyimide siloxanes is therefore not the mask. Accordingly, one skilled in the art would not consider combining the teachings of Farnworth relating to adhesive materials with that of Tsutsui. The Examiner states that Farnworth was cited for teaching the general step of patterning a polyimide photosensitive layer on a semiconductor wafer through a mask or reticle, and that patterning polyimide photoresist coated semiconductors is common in the art. However, this still does not address the fact that in Farnworth, a mask is used to form the pattern on the adhesive photosensitive materials. The adhesive layer formulated from polyimide siloxanes is not itself a mask, but only made using a mask. Thus, even if Tsutsui's WSi and gold layers arguably form a mask, one skilled in the art would not consider replacing this structure with Farnworth's adhesive materials, which are not a mask.

The Examiner states that "Farnworth teaches that the specific material of a polyimide is commonly known in the art for the application of Tsutsui." However, as states above, Farnworth teaches that an adhesive layer could be formulated from photosensitive materials known generally as polyimide siloxanes. A mask is used to

form the pattern on the adhesive photosensitive materials. The adhesive layer formulated from polyimide siloxanes is therefore not the mask.

The Examiner also states that the “references are analogous art as they are both drawn to patterning semiconductor layers using photosensitive and etching processes.” Even if correct, the fact that two references are analogous art, by itself, does not provide motivation or suggestion to one skilled in the art to combine the references.

Therefore, the teachings of Tsutsui and Farnworth are not properly combinable, and the rejection of Claim 9 and its dependent claims should be withdrawn.

Independent Claim 27 and 40 are similarly allowable over the combination of Tsutsui and Farnworth.

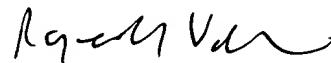
The Examiner also rejected Claims 9, 10, 12, 27, 30-33, 35, 37, 40, 43-45, 47, and 49 as being unpatentable over Tsutsui and Cloud. The Examiner stated in the final office action that while Tsutsui does not teach that the mask comprises non-photosensitive polyimide, Cloud teaches the use of polyimide in an integrated circuit structure. In particular, the Examiner states that Cloud teaches use of buffer layer 21 for (1) enhancing the strength of a tip 13, and (2) impeding the etching progress into the layer on which the buffering material is deposited. This teaching is not properly combinable with Tsutsui because the WSi and gold layers that the Examiner seeks to replace with the buffer layer are intended to perform neither function, i.e., the WSi and gold layers do not (1) enhance the strength of the structure, nor do they (2) impede the etching progress into the layer on which they are deposited. There is simply no teaching of these functions, or even any recognition of any need for them in Tsutsui. Tsutsui is thus not properly combinable with Cloud because one skilled in the art would have no motivation to combine the references in the manner suggested by the Examiner. These rejections should therefore also be withdrawn.

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In the advisory action, the Examiner states that "Cloud teaches the desirability of using the claimed polyimide." However, as discussed above, the functions of Tsutsui's WSi and gold layers are very different from that of Cloud's buffer layer, so there is no teaching of any desirability of using the disclosed polyimide.

Claims 9-12, 27, 29-40, and 42-50 are pending in the present application. As the application is now believed to be in condition for allowance, issuance of a Notice of Allowance is respectfully requested.

Respectfully submitted,



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